AFFDL-TM- 79-82-FXN

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WRIGHT PATTERSON AIR FORCE BASE OHIO

IMPROVED PROGRAMS TO TRANSFER DATA FROM A NICOLET 1090 DIGITAL
OSCILLOSCOPE TO A HEWLETT-PACKARD 9810 CALCULATOR

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Approved for public release; distribution unlimited.

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This Technical Memorandum has been reviewed and is approved for publication.

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ABSTRACT

These two programs were written to transfer data from a Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. They were written to replace a series of six programs described in AFFDL-TM-77-20 and thus simplify the oscilloscope recording process. Also included are operating instructions for these programs.

FOREWORD

This report contains the operating instructions and program for transferring data from the 1090 series digital oscilloscope to a 9810 Hewlett-Packard calculator tape cassette. The programs were written by David V. Breitenbecher. The work was performed as part of AFFDL in-house work unit number 24041304, "Development of Thermal and Flow Measurement Techniques," of task number 240413, "Aerodynamic Ground Test Technology" and covers work between August 1978 to November 1978.

The author wishes to acknowledge the invaluable assistance of Rita L. Kibler, who typed the drafts.

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SECTION I

INTRODUCTION

This report contains a brief description and instructions for operating two programs written to transfer data from Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. These two programs were written to replace a series of six programs described in AFFDL-TM-79-20-FXN and thus simplify the oscilloscope data recording process.

These programs are: Oscilloscope Recording Program - 1978, used to store data from the Nicolet 1090 digital oscilloscope on a tape cassette; and File Marking Program for Tamarak, used to make the storage cassette.

SECTION II

DIGITAL OSCILLOSCOPE CASSETTE RECORDING SYSTEM

There are two programs for controlling the flow of data between the Nicolet digital oscilloscope and the H-P tape cassette.

    a. File Marking Program for Tamarak (FMPT).

    b. Oscilloscope Recording Program - 1978 (ORP-78).

The first program is used to make a cassette on which the data from the digital oscilloscope may be stored. See "Instructions for Making Data Storage Cassette". The cassette tape contains the storage buffers for 4096 words from the oscilloscope memory plus storage area for other data as shown in Table 1.

The first program initialized the cassette tape, generates 65 files, each containing 64 registers, and writes the cassette number in the first register of the first file. The first file is also used to store the data shown in Table 1. The next 64 files, containing a total of 6094 words, are used to store oscilloscope memory data.

The second program has five uses for operations: one, List Scope Data, list the data in the first file; two, Change Run Number and Date; three, Record Scope Data, record data into the first file; four, Scope to Cassette, transfer data from the oscilloscope memory to the cassette; five, Cassette to Scope, transfer oscilloscope data from the cassette to the oscilloscope memory.

List Scope Data may be used any time the operator desires to know the contents of the first file. Change Run Number and Date may be used when the

TABLE I

STORAGE ALLOCATIONS IN THE FIRST FILE

LOC REG NO.	DATA
0	File Number/Cassette Number
1	Date
2	Number of Runs/Number of Divisions Used
3	Sweep Time Per Point Multiplier
4	Sweep Multiplier in Seconds
5	Number of Channels
6	Voltage Scale in Use
7	Voltage Scale in Use
8	Signal Offset in Volts
9	Signal Offset in Volts
10	Run Number of First Quarter
11	Run Number for Next Transfer
12	Number of Divisions on Oscilloscope
13-64	Not Used

operator wishes to reuse the cassette for new data and it is required to change the run number, date, and/or number of quarters to make the cassette correct. Record Scope Data is used to record scope data on a new cassette or when extensive changes must be made to preused cassette. Scope to Cassette is used to transfer memory data from the oscilloscope to the cassette. Cassette to Scope is used to transfer previously recorded data from a cassette back to the oscilloscope memory.

SECTION III

INSTRUCTIONS FOR MAKING DATA STORAGE CASSETTE

I. Software and Hardware Required:

    a. H-P 9810 calcuator with the following ROM's:

        1. Position 1 - Mathematics Block

        2. Position 2 - Peripheral Control

        3. Position 3 - Cassette Memory Plotter Printer Alpha

    b. H-P 9865 cassette memory

    c. Tape cassette

    d. Program - File Marking System for Tamarak

II. Operating the Program

    a. Turn on 9810

    b. Load program

        1. Press: END, CLR, RUN

        2. Place program card in calculator

        3. Press: LOAD

        4. Remove card

    c. Turn on cassette

        1. Place tape in cassette

        2. Rewind

d. Place files on tape

    1. Press: END, CLEAR, CTN

    2. Calculator will print and halt

<div align="center">

FILE MAKING

PROGRAM FOR

TAMARAK

****
</div>

    3. Enter file number

    4. Press: CTN

    5. Calculator will print file number, then place remaining files on the tape.

    6. When these files have been placed on the tape the calculator will print:

<div align="center">

FILES   1.*

THROUGH   65.

HAVE   64.

REGISTERS

****

END PROGRAM
</div>

e. See Appendix A for print out

SECTION IV

INSTRUCTIONS FOR OPERATING OSCILLOSCOPE RECORDING PROGRAM 1978

I. Software and Hardware Required:

    a. H-P 9810 calculator with the following ROM's:

        1. Position 1 - Mathematics

        2. Position 2 - Peripheral control

        3. Position 3 - Cassette Memory Plotter Printer Alpha

    b. H-P 9865 cassette memory

    c. Nic 1090 or 1090A digital oscilloscope

    d. Nic 191 digital interface

    e. Data storage cassette

    f. Program: Oscilloscope Recording Program - 1978

II. Operating Instructions

    a. Insert programmed data storage cassette into cassette memory.

    b. Connect and turn on calculator, cassette memory, oscilloscope, and digital interface.

    c. Set oscilloscope memory to ALL

    d. Rewind cassette memory

    e. Load program (Oscilloscope Recording Program - 1978)

        1. Press: END, CLR, RUN

        2. Place program card in calculator

3. Press: LOAD

4. Remove card

f. Run program

1. Press: END, CLR, CTN

2. Calculator will print and halt

```
            OSCILLOSCOPE
            RECORDING
            PROGRAM
        ****************
        '
        OPERATION CODES

        ***************

        1..LIST SCOPE
           DATA

        2..CHANGE RUN
           NUMBER AND
           DATE

        3..RECORD SCOPE
           DATA

        4..SCOPE TO
           CASSETTE

        5..CASSETTE TO
           SCOPE
        ***************
        ENTER OPERATION
        CODE
```

3. The operator then enters the operation code from above. See Section 2 for explanations of the codes. Go to the instruction for the operation code in Section V.

SECTION V

INSTRUCTIONS FOR OPERATION CODES

I. List Scope Data

   a. Enter 1

   b. Press CTN

   c. Program will print the following and halt

```
****************

OSCILLOSCOPE
   SETTINGS
    ******

CASSETTE NO.
        24.000

DATE
      780921.000

RUN NO.
         48.000

RUN NO.
         49.000

RUN NO.
         50.000

RUN NO.
         51.000

MEMORY SIZE
        1024.000

MEMORY DIVISIONS
         4.000

SWEEP TIME SEC.
MULTIPLIER
         0.500
```

9

```
             MAGNITUDE
                   -5.000

          NO. OF CHANNELS
                    2.000

          VOLTAGE SCALE
                   10.000

          VOLTS

          OFFSET

                    0.000

          VOLTS

          ***************

          ENTER OPERATION

          CODE
                     1.0*
          ***************
```

d. At this time the program is ready for another operation code.

e. See Appendix B for sample print out.

II. Change Run Number and Date

a. Enter 2

b. Press CTN

c. Program will print the following and halt

```
          ***************
          DATE  YYMMDD..→*
```

d. Enter date (year, year, month, month, day, day)

e. Press CTN

f. Program will print the following and halt

NO. OF RUNS

g. Enter number of runs

h. Press: CTN

i. Program will print the following and halt

RUN NO. OF
FIRST QUARTER →X

j. Enter run number of first quarter or first half

k. Press: CNT

l. Program will print the following and halt

****

ENTER OPERATION
CODE

****

m. At this point the program is ready for another operation code.

n. See Index C for sample print out

III. Record Scope Data

a. Enter 3

b. Press CTN

c. Program will print the following and halt

****

NO. OF DIVISIONS
ON SCOPE

d. Enter data, press CTN

e. Program will print the following and halt

                    ****

                    NO. OF DIVISION
                    USED

f. Enter data, press CTN

g. Program will print the following and halt

                    ****

                    SWEEP TIME PER
                    POINT
                     MULTIPLIER

h. Enter data, press CTN

i. Program will print the following and halt

                    ORDER OF
                    MAGNITUDE
                    IN SECONDS

j. Enter data, press CTN

k. Program will print the following and halt

                    ****

                    VOLTAGE SCALE
                    IN USE

l. Enter data, press CTN

m. Program will print the following and halt.

                    ****

                    SIGNAL OFFSET
                    IN VOLTS

n. Enter data, press CTN

o.   Program will print the following and halt

                         ****

                         ENTER OPERATION

                         CODE

p.   At this point the program is ready for another operation code

q.   See Appendix D for sample print out

IV. Scope to Cassette Transfer

a.   Enter 4

b.   Press CTN

c.   Program will transfer the data from the oscilloscope to the
cassette.

d.   Upon completion of the transfer the program will print the following
and halt.

                         ****

                         SCOPE→CASSETTE

                            TRANSFER

                         CONCLUDED

                         ****

                          ENTER OPERATION

                          CODE

e.   At this time the program is ready for another operation code.

f.   See Appendix E for sample print out.

V.   Cassette to Scope Transfer

a.   Enter 5

b.   Press CTN

c. Program will transfer data from the cassette to the oscilloscope.

d. Upon completion of the transfer the program will print the following and halt.

```
                    ****************
                    CASSETTE→SCOPE
                       TRANSFER

                    ****************

                    ENTER OPERATION
                    CODE
```

e. At this time the program is ready for another operation code.

f. See Appendix F for sample print out.

APPENDIX A

```
****************

 FILE MAKING
 PROGRAM FOR
   TAMARAK
****************

ENTER FILE NO.→X
             25.*

****************

FILES        1.*

THROUGH     65.

HAVE        64.

REGISTERS

****************

END PROGRAM

****************
```

APPENDIX B

ENTER OPERATION

CODE

   1.0*

****
OSCILLOSCOPE
SETTINGS
******

CASSETTE NO.
   25.000

DATE
   780921.000

RUN NO.
   48.000

RUN NO.
   49.000

RUN NO.
   50.000

RUN NO.
   51.000

MEMORY SIZE
   1024.000

MEMORY DIVISIONS
   4.000

SWEEP TIME SEC.
MULTIPLIER
   0.500

MAGNITUDE
   -5.000

NO OF CHANNELS
   2.000

VOLTAGE SCALE

      10.000

VOLTS

OFFSET

      0.000

VOLTS

APPENDIX C

ENTER OPERATION
CODE
      2.000*

****

DATE YYMMDD..→*
     780921.0*

NO. OF RUNS
      4.0*

RUN NO. OF
FIRST QUARTER →X
     48.0*

ENTER OPERATION
CODE

      3.000*

****

NO. OF DIVISION
ON SCOPE

      4.000*

****

SWEEP TIME PER
POINT
 MULTIPLIER

      0.500*

 ORDER OF
MAGNITUDE
 IN SECONDS

     -5.000*

****

VOLTAGE SCALE
IN USE

    10.000*

****

SIGNAL OFFSET

APPENDIX E

ENTER OPERATION
CODE

                    4.*

****

   SCOPE→CASSETTE
      TRANSFER
      CONCLUDED

APPENDIX F

ENTER OPERATION
CODE

                    5.*

****

CASSETTE→SCOPE
      TRANSFER
      CONCLUDED

                    (